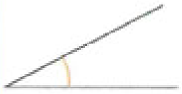
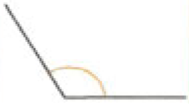
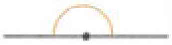
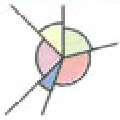
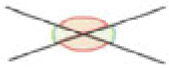
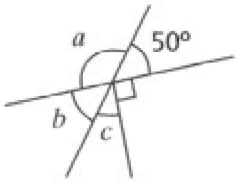
ORGANISE

# 8 Angle properties

## Angle facts

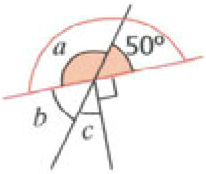
| Acute angle | Right angle | Obtuse angle | Straight line | Reflex angle | Angles at a point | Vertically opposite |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| Less than 90° | 90° | Between 90° and 180° | 180° | Between 180° and 360° | Angles at a point add up to 360° | Vertically opposite angles are equal |

Find the sizes of the angles labelled with letters. Give reasons for your answers.

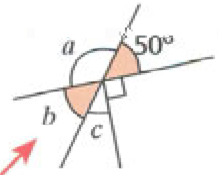


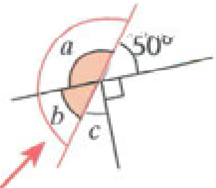

$a = 180° - 50° = 130°$

Angles on a straight line add up to 180°.




$b = 50°$



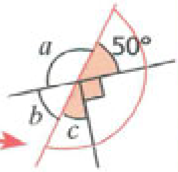




Vertically opposite angles are equal. OR Angles on a straight line add up to 180°.

$c + 90° + 50° = 180°$

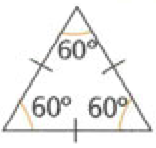
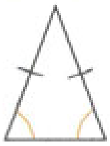
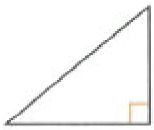
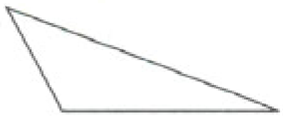
$c = 180° - 140° = 40°$

Angles on a straight line add up to 180°.



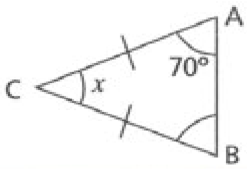

## Angles in triangles and quadrilaterals

Angles in a triangle add up to 180°.

| Equilateral | Isosceles | Right-angled | Scalene |
|---|---|---|---|
|  |  |  |  |
| All angles are 60° | Two equal angles at the base of the equal sides | One angle of 90° | No equal angles |



ABC is an isosceles triangle.
Work out the size of angle $x$.




Angle B = 70°

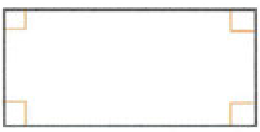
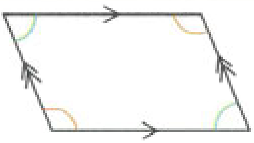
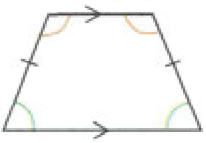
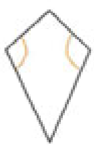
Base angles of an isosceles triangle are equal.

Angle $x = 180° - 70° - 70° = 40°$

Angles in a triangle add up to 180°.

> The equal angles at the base of the equal sides in an isosceles triangle may not be at the bottom of the diagram.

Angles in a quadrilateral add up to 360°.

| Rectangle or Square | Parallelogram or Rhombus | Isosceles trapezium | Kite |
|---|---|---|---|
|  |  |  |  |
| All angles are 90° | Opposite angles are equal | Two pairs of equal angles | One pair of equal angles |

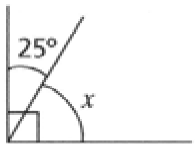
RETRIEVE

# 8 Angle properties

## Angle facts

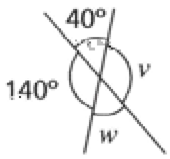
**1** Work out the size of each angle labelled with a letter. Give reasons for your answers.

**a)**




$x =$

**b)**



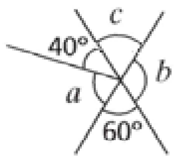

$v =$

$w =$

**c)**


$z =$

**d)**

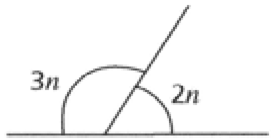



$a =$

$b =$

$c =$

**e)**



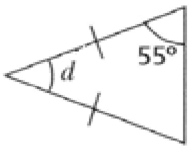

$2n =$

$3n =$

## Angles in triangles and quadrilaterals

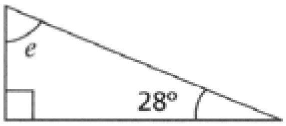
**2** Work out the size of each angle labelled with a letter. Give reasons for your answers.

**a)**



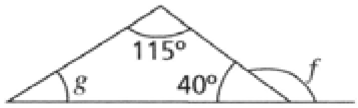

$d =$

**b)**




$e =$

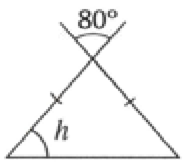
**c)**




$f =$

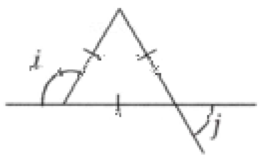
$g =$

**d)**




$h =$

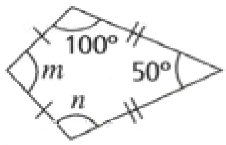
**e)**




$i =$

$j =$

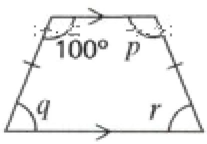
**f)**




$m =$

$n =$

**g)**

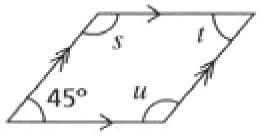



$p =$

$q =$

$r =$

**h)**




$s =$

$t =$

$u =$

ORGANISE

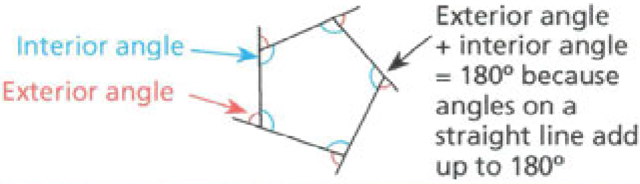
# 8 Angles in polygons

## Interior and exterior angles

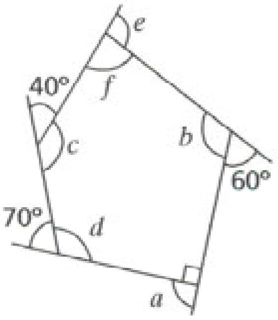
A polygon is a shape with straight sides.
A polygon has interior and exterior angles.

**Exterior angle + interior angle = 180°**

The exterior angles of any polygon add up to 360°.




Find the angles labelled with letters in this irregular pentagon.




$a = 180° - 90° = 90°$

$b = 180° - 60° = 120°$

$c = 180° - 40° = 140°$

$d = 180° - 70° = 110°$

$e = 360° - 60° - 90° - 70° - 40° = 100°$

The exterior angles of a polygon add up to 360°.

$f = 180° - 100° = 80°$

Use angles on a straight line to find angles $a$ to $d$ and $f$.

## Angles in regular polygons

In a regular polygon:

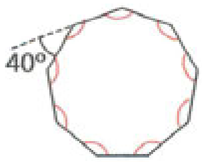
- all interior angles are equal
- all exterior angles are equal
- exterior angle = $\frac{360}{n}$ where $n$ = number of sides.

a) Find the size of an exterior angle of a regular nonagon.

A regular nonagon has 9 sides and 9 equal exterior angles.

Exterior angle of regular nonagon = $\frac{360°}{9} = 40°$

b) Find the size of one of its interior angles.

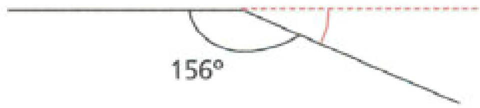



Interior angle
= 180° – exterior angle
= 180° – 40° = 140°

Exterior angle + interior angle = 180°

The diagram shows one interior and one exterior angle of a regular polygon.

How many sides does this polygon have?




Exterior angle = 180° – 156° = 24°

24° × number of exterior angles = 360°

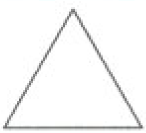
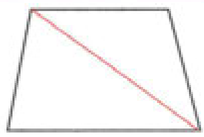
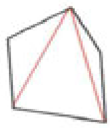
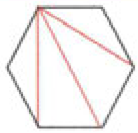
Exterior angles of a polygon add up to 360°.

Number of exterior angles = $\frac{360}{24} = 15$

The polygon has 15 sides.

## Angle sum of a polygon

The angle sum of a polygon is the sum of its interior angles.

| Triangle | Quadrilateral | Pentagon | Hexagon |
|---|---|---|---|
|  |  |  |  |
| Angle sum = 180° | Angle sum = 2 × 180° = 360° | Angle sum = 3 × 180° = 540° | Angle sum = 4 × 180° = 720° |

Angle sum = (number of sides – 2) × 180°
= $(n - 2) \times 180°$   $n$ = number of sides

Find the angle sum of a 10-sided polygon.

$(n - 2) \times 180°$   Substitute $n = 10$.

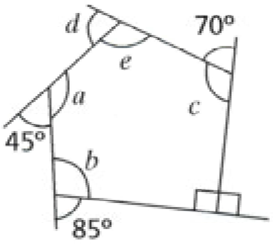
$= (10 - 2) \times 180° = 8 \times 180° = 1440°$

RETRIEVE

# 8 Angles in polygons

## Interior and exterior angles

1. Work out the size of each angle labelled with a letter.

a) 

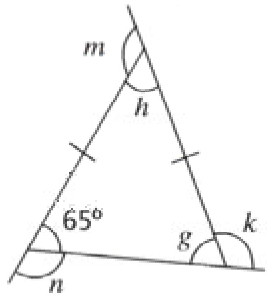

$a =$ ..........

$b =$ ..........

$c =$ ..........

$d =$ ..........

$e =$ ..........

b) 


$g =$ ..........

$h =$ ..........

$k =$ ..........

$m =$ ..........

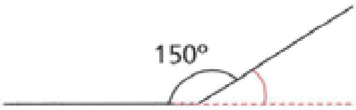
$n =$ ..........

## Angles in regular polygons

2. Find the size of an exterior angle and an interior angle of a regular octagon.

Exterior angle = .......... Interior angle = ..........

3. The diagram shows one interior and one exterior angle of a regular polygon. The interior angle is 150°.



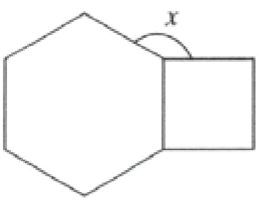

How many sides does this polygon have? ..........

## Angle sum of a polygon

4. Find the angle sum of a seven-sided polygon.

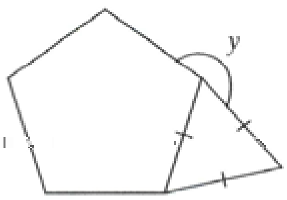
..........

5. The diagram shows a square and a regular hexagon.




Work out the size of angle $x$. $x =$ ..........

6. The diagram shows an equilateral triangle and a regular pentagon.




Work out the size of angle $y$. $y =$ ..........

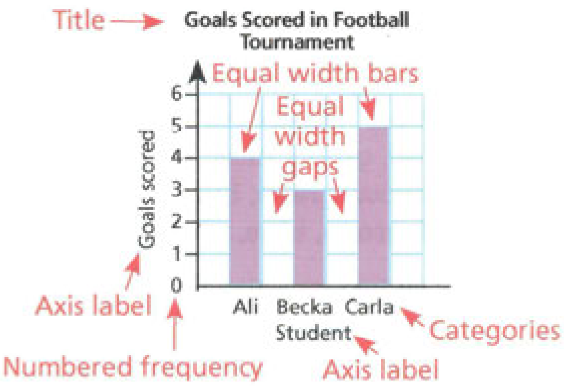
# 6 Bar charts and pictograms

## Bar charts

A bar chart is used to display data using rectangular bars of different heights or lengths.

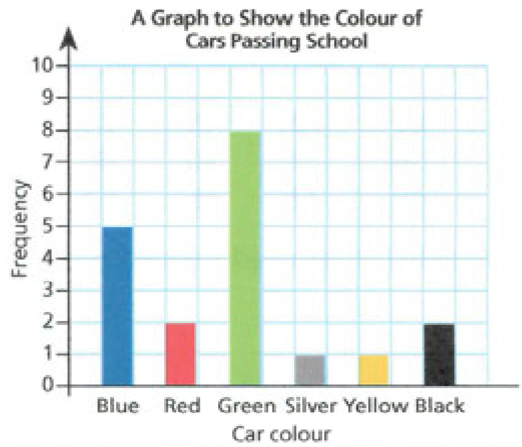
A bar chart must include:

- a title
- labels on both axes
- numbered frequency
- bars of equal width
- categories
- gaps of equal width between the bars.




This table shows the colours of cars that passed a school. Draw a bar chart for this information.

| Colour | Frequency |
|---|---|
| Blue | 5 |
| Red | 2 |
| Green | 8 |
| Silver | 1 |
| Yellow | 1 |
| Black | 2 |

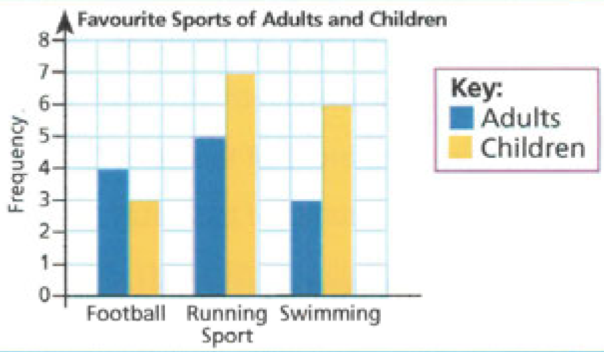



Dual bar charts show a comparison between two or more sets of data.

Dual bar charts must include a key to identify the different categories.

This two-way frequency table shows the favourite sports of some adults and children. Draw a dual bar chart for this information.

| | Football | Running | Swimming |
|---|---|---|---|
| **Adults** | 4 | 5 | 3 |
| **Children** | 3 | 7 | 6 |



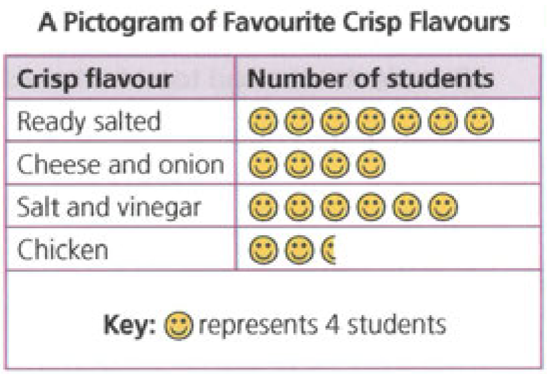

## Pictograms

A pictogram can also represent data. Unlike a bar chart, a pictogram uses rows or columns of pictures to represent frequency.

Half a picture represents half of the frequency in the key.

The table below shows the favourite flavour of crisps of some students. Draw a pictogram for this information.

| Crisp flavour | Frequency |
|---|---|
| Ready salted | 28 |
| Cheese and onion | 16 |
| Salt and vinegar | 24 |
| Chicken | 10 |



RETRIEVE

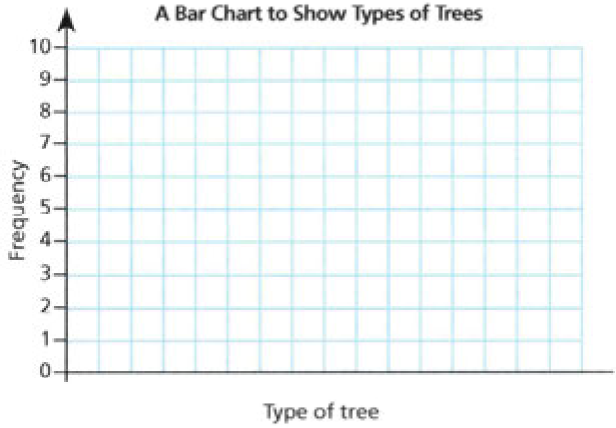
# 6 Bar charts and pictograms

## Bar charts

1. The types of trees in a particular area were recorded in the frequency table.

Draw a bar chart to represent this information.

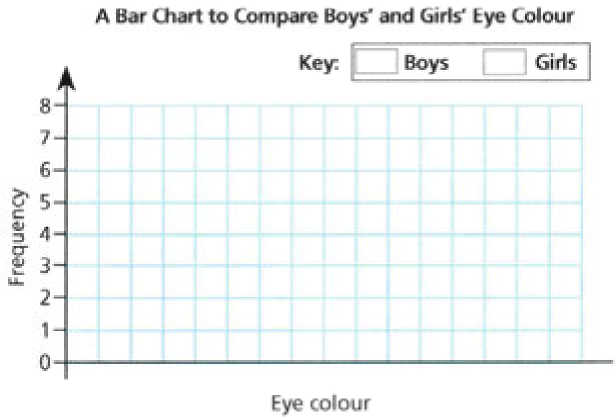
| Tree | Frequency |
|---|---|
| Oak | 2 |
| Birch | 5 |
| Evergreen | 8 |
| Pine | 10 |
| Cedar | 7 |




2. The eye colours of some boys and girls were recorded in the frequency table.

Draw a dual bar chart to represent this information.

| Eye colour | Boys | Girls |
|---|---|---|
| Blue | 8 | 7 |
| Green | 4 | 4 |
| Brown | 2 | 4 |




## Pictograms

3. The table below shows the favourite sports of some Year 8 students.

Complete the pictogram to represent this information.

| Sport | Frequency |
|---|---|
| Badminton | 20 |
| Netball | 15 |
| Basketball | 25 |
| Table tennis | 5 |

**Favourite Sports of Year 8 Students**

| | |
|---|---|
| Badminton | |
| Netball | |
| Basketball | |
| Table tennis | |
| **Key:** = 5 | |

4. The table below shows the number of cupcakes sold by a shop over 6 days.

Complete the pictogram to represent this information.

| Day | Frequency |
|---|---|
| Monday | 30 |
| Tuesday | 15 |
| Wednesday | 24 |
| Thursday | 21 |
| Friday | 42 |
| Saturday | 57 |

**Number of Cupcakes Sold**

| | |
|---|---|
| Monday | |
| Tuesday | |
| Wednesday | |
| Thursday | |
| Friday | |
| Saturday | |
| **Key:** = 6 cupcakes | |

ORGANISE

# 6 Pie charts and scatter graphs

## Pie charts

**Pie charts** use a circle to display data. Pie charts show the **proportion** or **fraction** of each category within the data compared to the whole circle.

To find the size of each angle, multiply the fraction by 360 because there are 360° in a circle. Always label the sections of a pie chart.

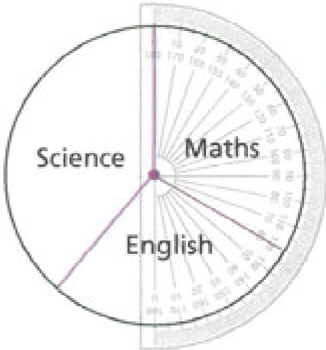
The frequency table (right) shows the favourite subject of 36 students.

| Subject | Frequency |
|---|---|
| Maths | 12 |
| English | 10 |
| Science | 14 |

Draw a pie chart to show this data.

To find the size of each angle, express each subject's frequency as a fraction of the total number of students asked, and multiply this by 360°.

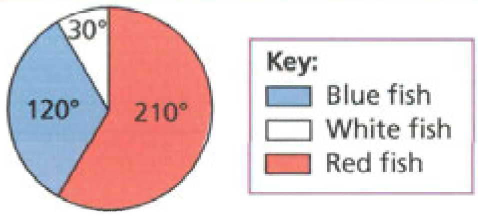
| Subject | Frequency | Fraction | Angle |
|---|---|---|---|
| Maths | 12 | $\frac{12}{36}$ | 120° |
| English | 10 | $\frac{10}{36}$ | 100° |
| Science | 14 | $\frac{14}{36}$ | 140° |




To draw a pie chart, use a **protractor** to mark off the angles that are needed.

You can find the frequency of a category if given the total frequency and the size of an angle in a pie chart.

The pie chart shows the proportion of different fish in a tank. There are 24 fish in total.




Work out how many blue fish are in the tank.

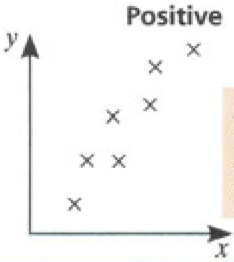
$\frac{120}{360} \times 24 = 8$

There are 8 blue fish in the tank.

## Scatter graphs

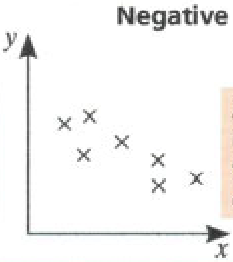
Scatter graphs show the relationship between two sets of **numerical** data.
The relationship is described using **correlation**. There are three types of correlation:

**Positive**



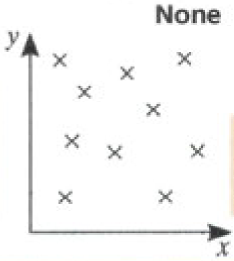

As one increases the other increases

**Negative**




As one increases the other decreases

**None**



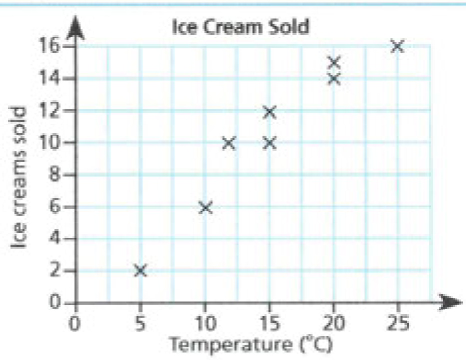

No pattern or relationship

Correlation is strong if the points on a scatter graph closely follow a straight line. Correlation is weak if the points are more loosely spread from a straight line.

A shopkeeper records the temperature for 8 days and the number of ice creams sold.

| Temperature (°C) | Ice creams sold |
|---|---|
| 20 | 14 |
| 15 | 10 |
| 25 | 16 |
| 10 | 6 |
| 20 | 15 |
| 5 | 2 |
| 15 | 12 |
| 12 | 10 |

**a)** Plot the data on a scatter graph.




**b)** What type of correlation does the graph show?

A positive correlation. The higher the temperature, the more ice creams that are sold.

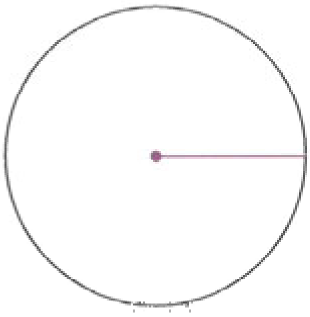
RETRIEVE

# 6 Pie charts and scatter graphs

## Pie charts

**1** The frequency table shows the favourite colour of 36 students.

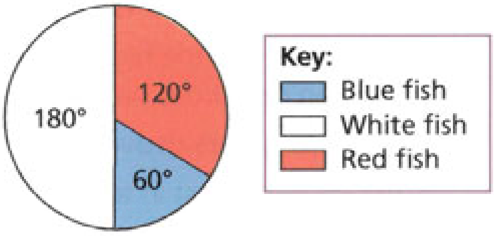
| Colour | Frequency | Fraction | Angle |
|---|---|---|---|
| White | 9 | | |
| Green | 20 | | |
| Red | 7 | | |



**a)** Complete the table.

**b)** Draw a pie chart to represent this information.

**2** The pie chart shows the proportion of different fish in a tank. There are 48 fish in total.




**a)** Work out the number of blue fish in the tank. ..........

**b)** Work out the number of white fish in the tank. ..........

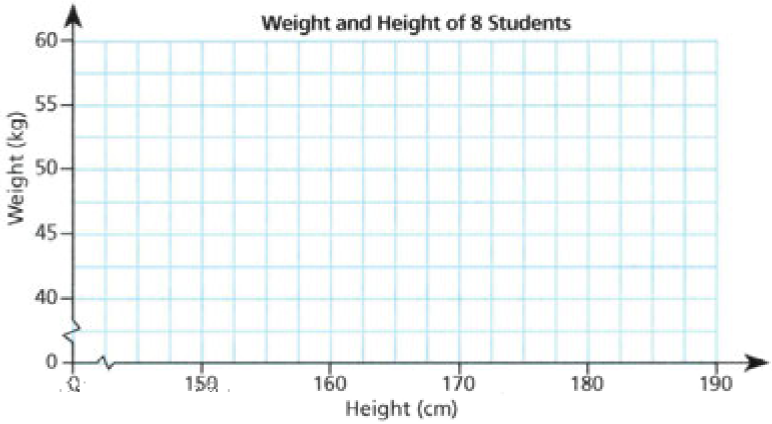
**c)** Work out the number of red fish in the tank. ..........

## Scatter graphs

**3** The height and weight of 8 students are shown in the table.

| Height (cm) | Weight (kg) |
|---|---|
| 150 | 45 |
| 156 | 46 |
| 156 | 51 |
| 181 | 57 |
| 170 | 51 |
| 172 | 58 |
| 165 | 52 |
| 180 | 50 |

**a)** Plot the data on a scatter graph.



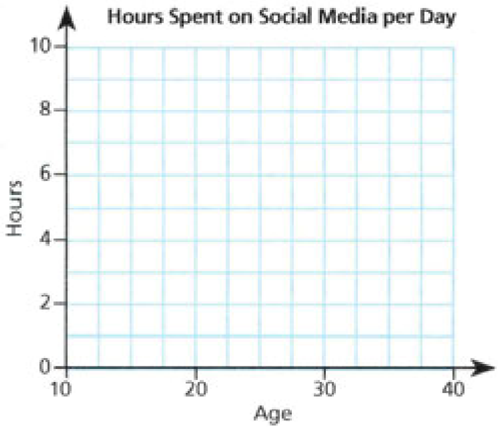

**b)** Describe the correlation between height and weight.

..........

**4** The number of hours spent on social media by people of different ages is shown in the table.

**a)** Plot the data on the scatter graph.

| Age | Hours spent on social media per day |
|---|---|
| 10 | 10 |
| 15 | 8 |
| 21 | 6 |
| 27 | 4 |
| 32 | 2 |




**b)** Describe the correlation between age and the number of hours spent on social media in a day.

..........

# Frequency tables

## Data types and frequency tables

**Data** is a set of information that can be analysed. Data can be collected by using tables, which makes it easier to read and understand.

**Qualitative** data is data that describes something (e.g. colour of hair; colour of eyes).

**Quantitative** data is data that is numerical (e.g. height; shoe size).

There are two types of quantitative data:

- **Discrete** data can only take certain values (e.g. the number of people in a room; the number of pages in a book).
- **Continuous** data can take any value (e.g. the time taken to run a race; the mass of an object).

A **grouped** frequency table is used to organise and simplify a large set of data into smaller groups. A frequency table containing **ungrouped** data has data that has not been put into categories or simplified.

The heights of 16 students were recorded in centimetres. Organise the heights into a grouped frequency table.

159 140 145 149 150 134 144 151
155 144 157 141 158 146 132 160

| Height, $h$ cm | Frequency |
|---|---|
| $130 < h \leqslant 140$ | 3 |
| $140 < h \leqslant 150$ | 7 |
| $150 < h \leqslant 160$ | 6 |
| | **Total = 16** |

The line underneath the 'less than' symbols means 'less than or equal to'. Notice that a height of 140 cm is included in the first group.

The test scores of 21 students were recorded. Organise the test scores in an ungrouped frequency table.

6 10 10 9 7 8 7 9 9 5 6 8 7
9 8 10 9 7 9 10 5

| Test score | Tally | Frequency |
|---|---|---|
| 5 | \|\| | 2 |
| 6 | \|\| | 2 |
| 7 | \|\|\|\| | 4 |
| 8 | \|\|\| | 3 |
| 9 | ~~\|\|\|\|~~ \| | 6 |
| 10 | \|\|\|\| | 4 |
| | | **Total = 21** |

The **mean**, **median**, **mode** and **range** can be calculated from a frequency table.

**Mean** $= \frac{\text{sum of all values}}{\text{number of values}}$

$= \frac{(5\times2)+(6\times2)+(7\times4)+(8\times3)+(9\times6)+(10\times4)}{21}$

$= 8$

**Median** $= \frac{21+1}{2} =$ 11th value

$= 8$

If the total frequency is odd, find the median by calculating $(n+1) \div 2$, where $n$ is the number of values in the data set and the result is the position of the middle number.

The **mode** is the most common value. This is the test score with the highest frequency.

The **mode** is 9.

**Range** = highest score − lowest score

= 10 − 5 = 5

## Two-way frequency tables

A two-way frequency table is used to display data from two different categories.

Remember to include the totals for both categories in a two-way frequency table.

Primary and secondary students were asked if they eat breakfast in the mornings before school.
38 students in primary had breakfast. 12 students in primary did not have breakfast.
22 students in secondary had breakfast. 28 students in secondary did not have breakfast.
Record these results in a two-way frequency table.

| | Breakfast | No breakfast | Total |
|---|---|---|---|
| **Primary** | 38 | 12 | 50 |
| **Secondary** | 22 | 28 | 50 |
| **Total** | 60 | 40 | 100 |

RETRIEVE

# 6 Frequency tables

## Data types and frequency tables

**1** Here is a list of the colours of cars in a car park:

**green, blue, green, red, red, green, yellow, yellow, blue, red, green, yellow, yellow, yellow, red, green, blue, red, red, yellow, green, yellow, green, blue, yellow, blue, blue, red, green, blue, yellow**

a) Is this data quantitative or qualitative?

b) Display this data in a frequency table.

| Colour | Tally | Frequency |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | Total = |

**2** Here are the speeds of 20 vehicles, to the nearest mph:

| | | | | | | |
|---|---|---|---|---|---|---|
| **45** | **65** | **72** | **48** | **74** | **67** | **68** |
| **46** | **56** | **53** | **58** | **68** | **72** | **64** |
| **62** | **49** | **72** | **55** | **67** | **51** | |

Complete the grouped frequency table.

| Speed, $x$ mph | Tally | Frequency |
|---|---|---|
| $40 < x \leqslant 50$ | | |
| $50 < x \leqslant 60$ | | |
| $60 < x \leqslant 70$ | | |
| $70 < x \leqslant 80$ | | |
| | | |

**3** Here are the temperatures at midday for 7 days (in °C):

**23, 24, 24, 23, 24, 25, 21**

a) Display this data in an ungrouped frequency table.

b) What is the mean of this data?

c) What is the median of this data?

d) What is the mode of this data?

e) What is the range of this data?

| Temperature | Tally | Frequency |
|---|---|---|
| 21°C | | |
| 22°C | | |
| 23°C | | |
| 24°C | | |
| 25°C | | |
| | | |

## Two-way frequency tables

**4** Students were asked what they ate for breakfast and lunch.

26 students who had porridge for breakfast had a sandwich for lunch.
14 students who had toast for breakfast had a sandwich for lunch.
10 students who had porridge for breakfast had a hot meal for lunch.
20 students who had toast for breakfast had a hot meal for lunch.

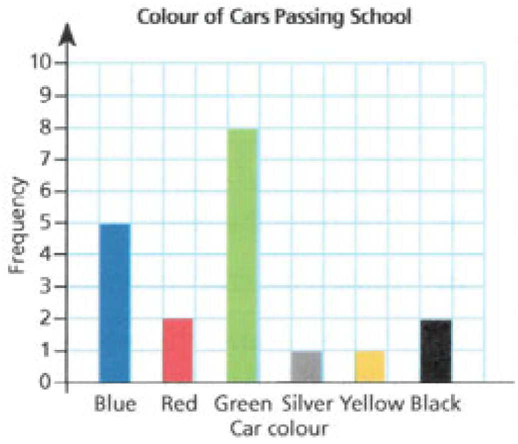
Complete the two-way frequency table.

| | Sandwich | Hot meal | Total |
|---|---|---|---|
| **Porridge** | | | |
| **Toast** | | | |
| **Total** | | | |

# Interpreting statistical representations

## Interpreting statistical measures and representations

The bar chart shows information about the colour of cars passing a school over a 10-minute period.




a) How many blue cars drove past?

Read off the frequency from the $y$-axis of the blue car category.

5 blue cars drove past.

b) How many more green cars than silver cars drove past?

Find how many cars of each colour drove past and find the difference between them by **subtracting**.

7 more green cars than silver cars drove past.

c) What colour of car drove past the most?

Green cars had the highest frequency, so green cars drove past most often. This is the **mode**.

d) How many cars drove past in total?

19 cars drove past in total. To find the total, add together the frequencies of each colour of car.

## Choosing an appropriate statistical measure

When choosing an appropriate statistical measure, consider the advantages and disadvantages of each.

| Measure of central tendency | Advantage | Disadvantage |
|---|---|---|
| Mean | Takes account of every value | Affected by very large or very small values |
| Median | Unaffected by very large or very small values | May not be an actual number in the data set |
| Mode | Only average that can be used for qualitative data | There may be more than one mode or no mode |

The salaries of five employees in a company are:

£23 000 £25 000 £30 000 £33 000 £120 000

Which statistical measure should be used to represent the average?

The **median** should be used because it is unaffected by very large or very small values. £120 000 is a very large value compared to the others.

A shop wants to find the average size of shoe sold to help it to decide which size it needs most stock of. The sizes sold on a particular day are:

3, 4, 4, 5, 6, 7, 8, 8, 9, 9, 9, 9, 9, 10, 10, 11, 12, 14

Which statistical measure should be used for the average?

The **mode** (9) should be used because it shows which shoe size is in greatest demand.

The heights of some Year 8 students, in metres, are:

1.72, 1.54, 1.57, 1.50, 1.55, 1.46, 1.63, 1.61

Which statistical measure should be used for the average height?

The **mean** should be used because it takes account of every value and there are few very large or very small values in the data set.

The range is not a measure of central tendency. It measures the spread of the data set.

The daily temperatures across March last year for two cities are summarised in this table.

| City | Mean maximum daily temperature | Range of maximum daily temperature |
|---|---|---|
| A | 22°C | 6°C |
| B | 22°C | 13°C |

Which city should you choose if you want to enjoy high temperatures? Justify your answer.

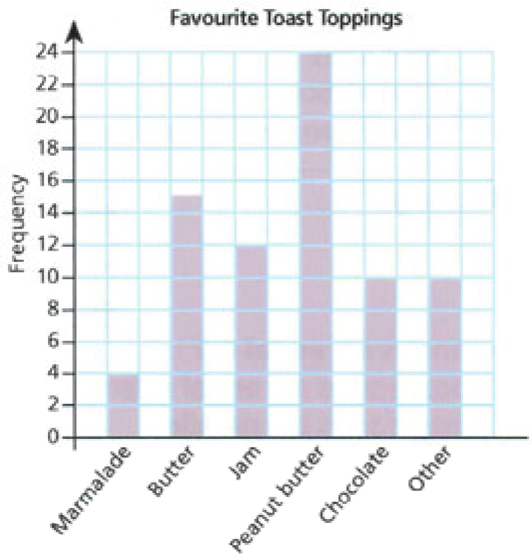
City A should be the city you choose to visit. Both cities have the same mean, but city A has the smaller range. This means that the temperature is more consistently high in city A compared to city B.

RETRIEVE

# 6 Interpreting statistical representations

## Interpreting statistical measures and representations

**1** The bar chart shows the preferred toast toppings of a group of students.




**a)** How many students prefer chocolate on their toast? ..........

**b)** How many students prefer marmalade on their toast? ..........

**c)** How many more students prefer butter on their toast than jam? ..........

**d)** What is the mode of this data? ..........

**e)** How many students took part in the survey? ..........

## Choosing an appropriate statistical measure

**2** A boutique had daily sales of **£326, £540, £385, £450, £2435, £459** and **£493** over the last week.

Is the mean or median a more reliable measure of central tendency? Justify your answer.

..........

..........

**3** The favourite subjects of some students were collected and recorded:

**French, PE, Maths, Science, Maths, ICT, Maths, DT, Maths**

Which measure of central tendency can best be used to describe this data? Justify your answer.

..........

..........

**4** The daily temperatures across March last year for two cities are summarised in this table.

| City | Mean maximum daily temperature | Range of maximum daily temperature |
|---|---|---|
| C | 12°C | 8°C |
| D | 21°C | 8°C |

Which city should you choose to visit if you want to enjoy high temperatures? Justify your answer.

..........

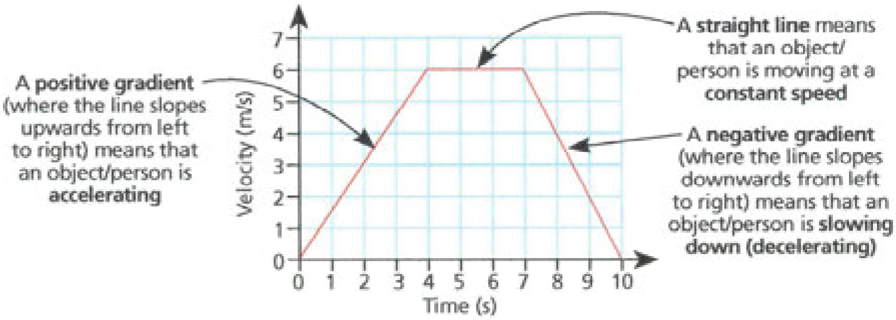
..........

ORGANISE

# 7 Interpreting other real-life graphs

## Velocity–time graphs

**Velocity–time graphs** show how acceleration changes over time. Time is on the horizontal ($x$) axis and velocity (or speed) is on the vertical ($y$) axis. Make sure you understand what the gradient of the line on a velocity–time graph represents.



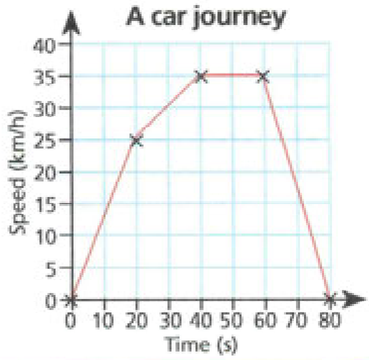

The speed of a car is recorded at 20-second intervals and shown on this speed–time graph. Describe the car's speed.

Between 0 and 20 seconds, the car is accelerating.

Between 20 and 40 seconds, the car is accelerating but at a slower rate because the gradient has decreased.

Between 40 and 60 seconds, the car is moving at a constant speed.

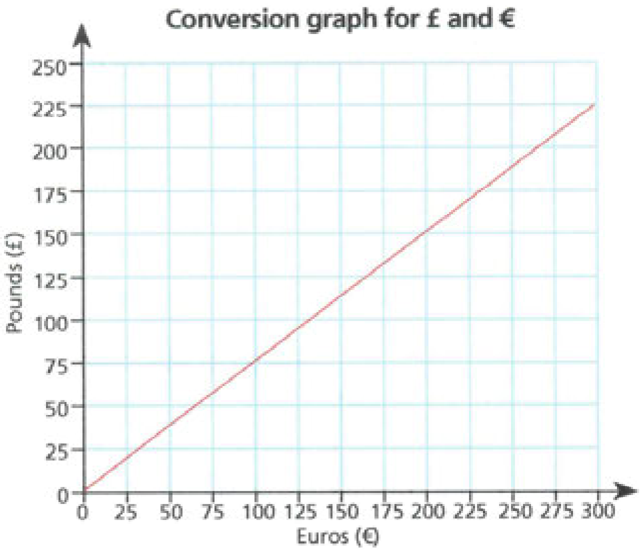
Between 60 and 80 seconds, the car is slowing down (decelerating) until it stops moving at 80 seconds.

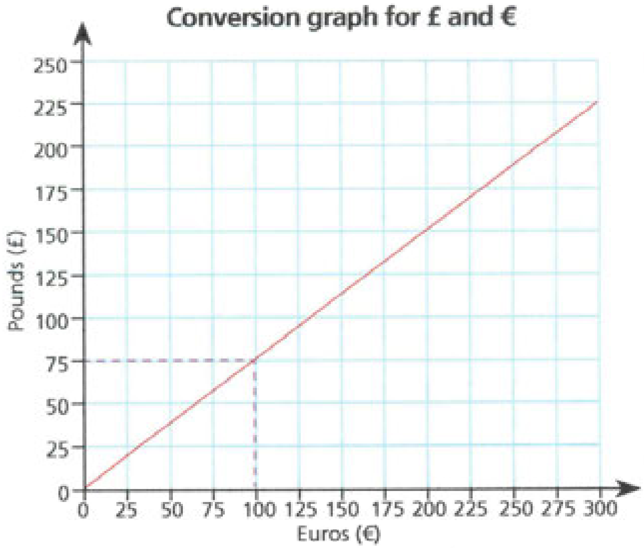



## Conversion graphs

**Conversion graphs** are straight line graphs that can be used to convert from one unit to another. They are often used for currency conversions and measurement conversions.

This graph converts between pounds (£) and euros (€) using an exchange rate on a particular day. How many pounds would you get for €100?




Use a ruler to draw a vertical line from the amount in the currency you have been given, until you reach the graph. Then draw a horizontal line to the other axis to find how much it converts to.

According to the graph, €100 = £75

When interpreting real-life graphs, make sure you consider:

- the gradient of the line
- the $y$-intercept.

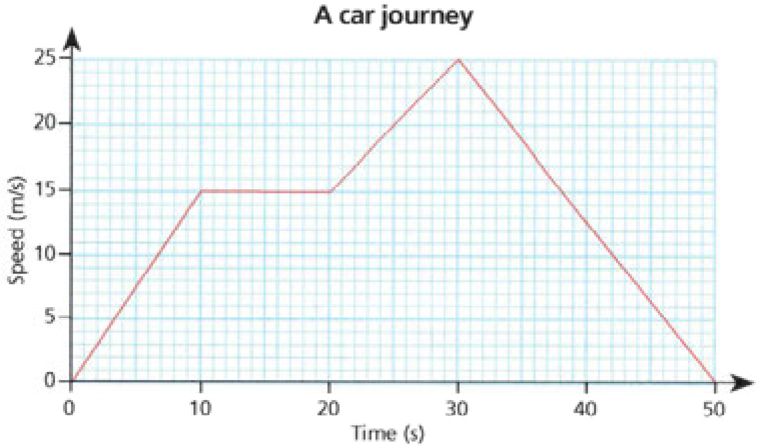
RETRIEVE

# 7 Interpreting other real-life graphs

## Velocity-time graphs

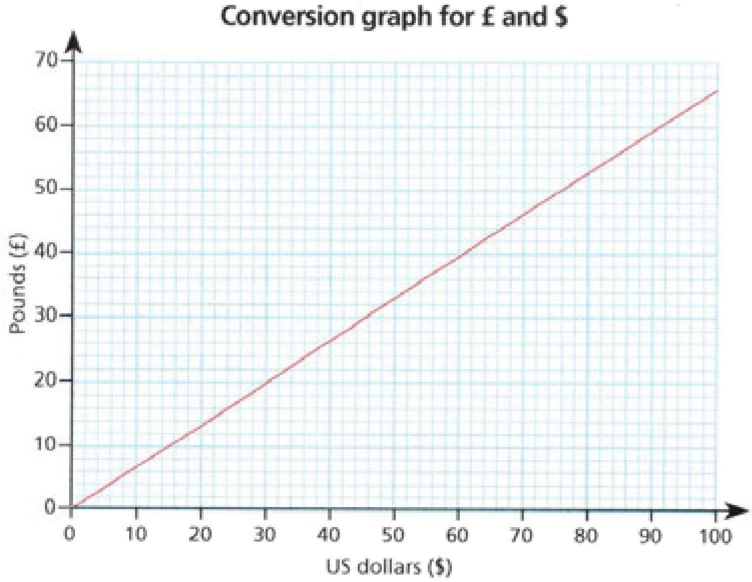
1. The velocity–time graph shows a 50-second car journey.

Describe the car's journey.




## Conversion graphs

2. The graph converts between pounds (£) and US dollars ($) using an exchange rate on a particular day.




**a)** How much is $60 worth in pounds? £........

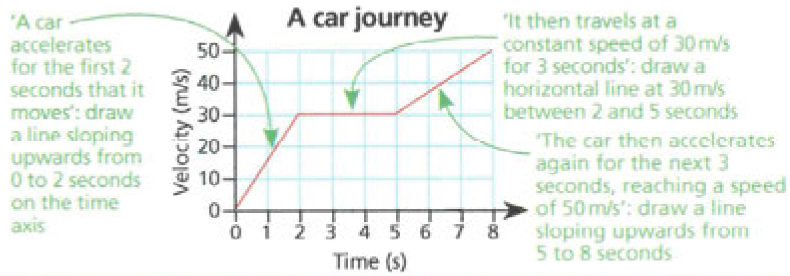
**b)** How much is £20 worth in US dollars? $........

# 7 Plotting real-life graphs

## Velocity–time graphs

A car accelerates for the first 2 seconds that it moves. It then travels at a constant speed of 30 m/s for 3 seconds. The car then accelerates again for the next 3 seconds, reaching a speed of 50 m/s.

Draw a velocity–time graph to represent this information.

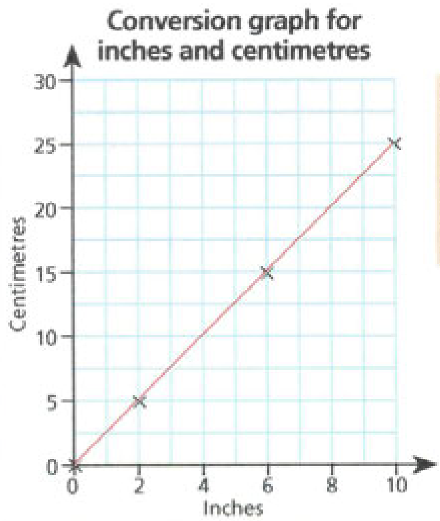



## Conversion graphs

When there is a table of values, a conversion graph is plotted in the same way as a linear graph in the form $y = mx + c$. The first row of the table of values is usually plotted against the $x$-axis and the second row against the $y$-axis.

Use the information in the table to draw a conversion graph for inches and centimetres.

| Inches | 0 | 2 | 6 | 10 |
|---|---|---|---|---|
| Centimetres | 0 | 5 | 15 | 25 |




Plot the points (0, 0), (2, 5), (6, 15) and (10, 25) from the table of values.

An electrician charges a £20 call-out fee plus £30 per hour of work she does.

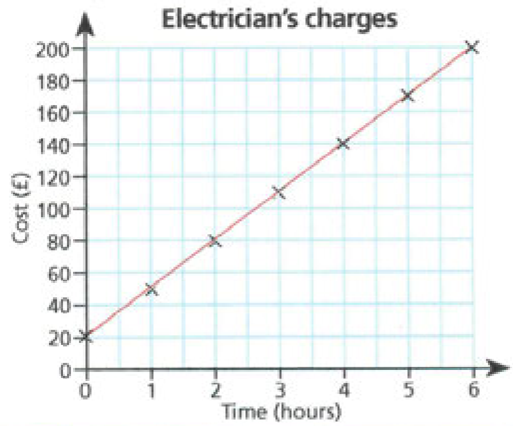
a) Complete the table of costs for different lengths of jobs.

| Time (hours) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Cost (£) | | | | | | | |

The charge at 0 hours is £20 because this is the call-out fee. For every hour, the cost increases by £30.

| Time (hours) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Cost (£) | 20 | 50 | 80 | 110 | 140 | 170 | 200 |

b) Plot a graph of cost against time.




A conversion is given that 5 miles = 8 km.

a) Complete the table using this fact.

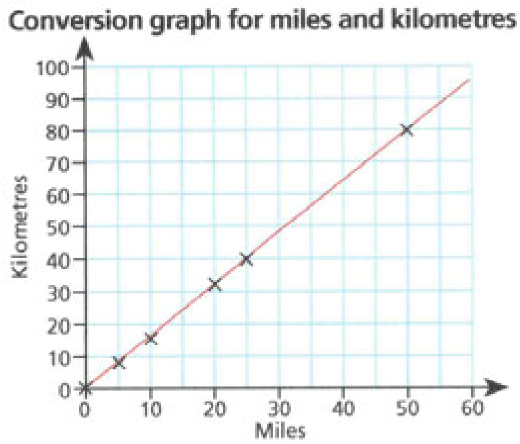
| Miles | 5 | 10 | 20 | 25 | 50 |
|---|---|---|---|---|---|
| Kilometres | | | | | |

The two units are in direct proportion. This means that if one part of the ratio is multiplied or divided by an amount, the same is done to the other part, e.g.:

×2 ( 5 miles : 8 km → 10 miles : 16 km ) ×2   ×4 ( 5 miles : 8 km → 20 miles : 32 km ) ×4

| Miles | 5 | 10 | 20 | 25 | 50 |
|---|---|---|---|---|---|
| Kilometres | 8 | 16 | 32 | 40 | 80 |

b) Draw a conversion graph from the point (0, 0) to represent this information.



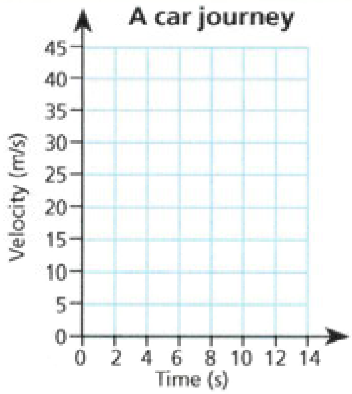
RETRIEVE

# 7 Plotting real-life graphs

## Velocity–time graphs

**1** A car accelerates for the first 2 seconds that it moves. It then travels at a constant speed of 40 m/s for 8 seconds. The car then slows down for 1 second, and then travels at a constant speed of 20 m/s for 2 seconds.

Draw a velocity–time graph to represent this information.



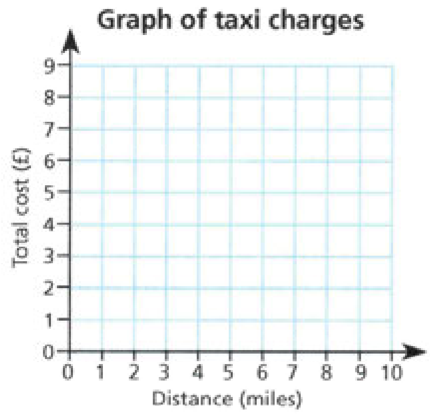

## Conversion graphs

**2** A taxi driver charges customers a fixed amount of £3 plus an extra 50p for every mile travelled.

**a)** Use this information to complete the table.

| Distance (miles) | 0 | 1 | 2 | 4 | 6 | 8 | 10 |
|---|---|---|---|---|---|---|---|
| Total cost (£) | | | | | | | |

**b)** Use this information to complete the graph showing the total cost to customers for journeys of up to 10 miles.

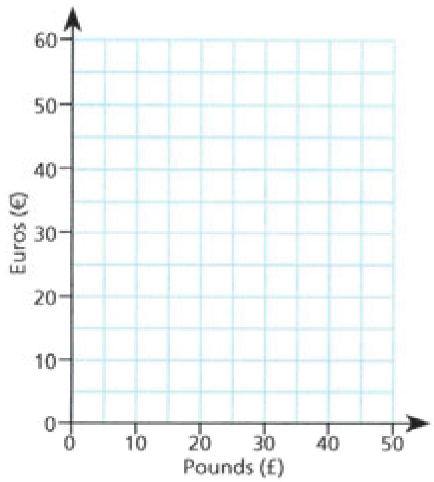



**3** **a)** A conversion is given that £1 = €1.20

Complete the table using this fact.

| Pounds (£) | 1.00 | 10.00 | | 25.00 | |
|---|---|---|---|---|---|
| Euros (€) | 1.20 | | 24.00 | | 60.00 |

**b)** Draw a conversion graph to represent this information. Start by plotting the point (0, 0).

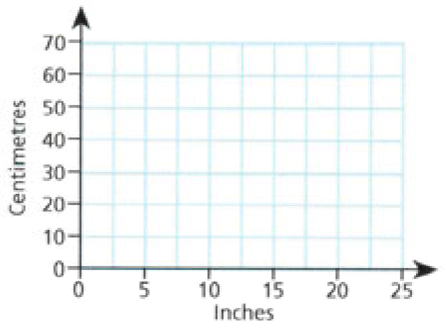



**4** **a)** A conversion is given that 2 inches = 5 cm.

Complete the table using this fact.

| Inches | 2 | 4 | 12 | 20 | 25 |
|---|---|---|---|---|---|
| Centimetres | | | | | |

**b)** Draw a conversion graph to represent this information. Start by plotting the point (0, 0).



ORGANISE

# 7 Area and circumference of a circle

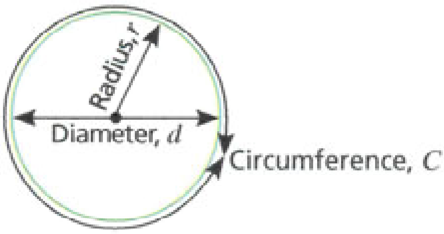
## Circumference of a circle

Circumference of a circle = perimeter of circle

Diameter = 2 × radius

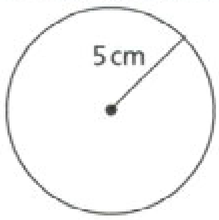
$d = 2r$

**Circumference of a circle:** $C = 2\pi r$ or $C = \pi d$




**Work out the circumference of each circle. Give your answers to 1 decimal place.**

**a)**




You know the radius, so use $C = 2\pi r$

$C = 2\pi r$

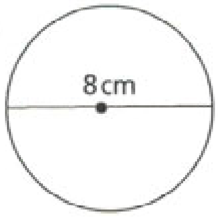
$= 2 \times \pi \times 5$

Use the $\pi$ key on your calculator.

$= 31.41592\ldots$

$C = 31.4$ cm (1 d.p.)

**b)**




You know the diameter, so use $C = \pi d$

$C = \pi d$

$= \pi \times 8$

$= 25.13274\ldots$

$C = 25.1$ cm (1 d.p.)

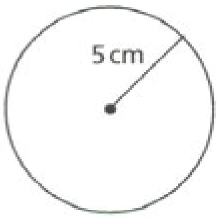
## Area of a circle

The area of a circle is the space inside the circumference.

**Area of a circle:** $A = \pi r^2$

**Work out the area of each circle. Give your answers to 1 decimal place.**

**a)**




$A = \pi r^2$

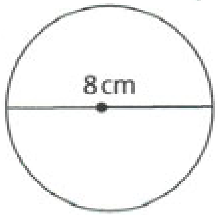
$= \pi \times 5^2$

Use the $\pi$ key on your calculator.

$= 78.5398\ldots$

$A = 78.5$ cm² (1 d.p.)

**b)**




You know the diameter, so find the radius first.

$r = 8 \div 2 = 4$

$A = \pi r^2$

$= \pi \times 4^2$

$= 50.2654\ldots$

$A = 50.3$ cm² (1 d.p.)

## Area and circumference problems

Remember which formula is which.

**Area**

² in formula and units

$A = \pi r^2$ measured in cm² (or km² or m² or mm²)

**Circumference**

No ² in formula or units

$C = 2\pi r$ or $C = \pi d$ measured in cm (or km or m or mm)

**A circle has circumference 36 cm. Work out its area. Give your answer to 1 decimal place.**

$2\pi r = 36$ Use $C = 2\pi r$ to write an equation.

$\div 2\pi$ $2\pi r = 36$ $\div 2\pi$

$r = \frac{36}{2\pi}$ Solve the equation to find $r$.

$r = 5.7295\ldots$ cm Use a calculator. Keep several decimal places in your value for $r$.

$A = \pi r^2$

$= \pi \times 5.7295^2$ Use your value of $r$.

$= 103.1295\ldots$

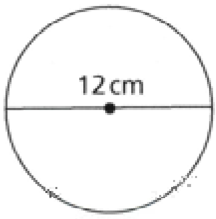
$A = 103.1$ cm² (1 d.p.) Round to 1 decimal place.

# 7 Area and circumference of a circle

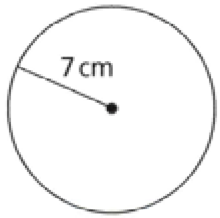
## Circumference of a circle

1 Work out the circumference of each circle. Give your answers to 1 decimal place.

a)



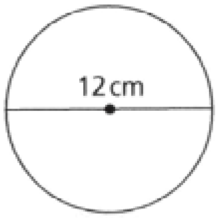

b)



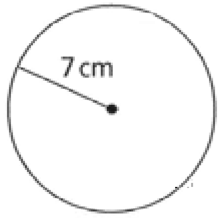

## Area of a circle

2 Work out the area of each circle. Give your answers to 1 decimal place.

a)




b)




## Area and circumference problems

3 A circle has circumference 50 cm.

Work out its radius. Give your answer to 1 decimal place.

4 A circle has circumference 72 cm.

Work out its diameter. Give your answer to 1 decimal place.

5 A circle has area 48 $cm^2$.

Giving your answers to 1 decimal place, work out:

**a)** its radius **b)** its diameter **c)** its circumference